Different forms of the equation of a straight line

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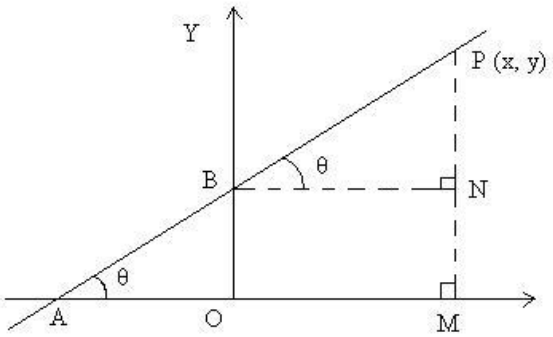
The equation of a straight line can be written in different forms depending on the data given. The different forms are as follows:

- SLOPE INTERCEPT FORM OF A LINE
- POINT SLOPE FORM OF A LINE
- TWO POINT FORM OF A LINE
- THE INTERCEPT FORM OF A LINE
- NORMAL FORM OR PERPENDICULAR FORM OF A LINE
- DISTANCE FORM OF A LINE

Let’s discuss a few of these in detail.

Slope Intercept Form of a Line



The equation of a line withslope m and making anintercept c on y – axis is y = mx + c

Proof: Let the given line intersects y – axis at B and makes an angle ? with x – axis. Then m = tan ?. Let P (x, y) be any point on the line. Draw PM perpendicular to x – axis and BN perpendicular to PM.

Clearly ?NBP = ?, BN = OM = x and PN = PM – NM = PM – OB = y – c
From ?PNB, we have
tan ? = PN/BN = (y – c)/x
m = (y – c)/x
y = mx + c, which is the required equation of the line.

Important Remarks

1. If the line passes through the origin, then 0 = m0 + c; c = 0. Therefore, the equation of a line passing through the origin is y = mx, where m is the slope of the line.

2. If the line is parallel to x – axis, then m = 0, therefore the equation of a line parallel to x – axis is y = c.

Point – Slope Form of a Line

The equation of a line which passes through the point (x1, y1) and has the slope m is

$y - y1 = m(x - x1)$

Proof: Let Q (x1, y1) be the point through which the line passes and let
P (x, y) be any point on the line. Then, slope of the line is $\frac{y - y1}{x - x1}$

But, m is the slope of the line.
So, $m = \frac{y - y1}{x - x1}$

$y - y1 = m(x - x1)$
Hence, $y - y1 = m(x - x1)$ is the required equation of the line.

Two – Point Form of a line

The equation of a line passing through two points (x1, y1) and (x2, y2) is
$y - y1 = \frac{y2 - y1}{x2 - x1} (x - x1)$

Proof: Let m be the slope of the line passing through (x1, y1) and (x2, y2). Then,
$m = \frac{y2 - y1}{x2 - x1}$

So, the equation of the line is
$y - y1 = m (x - x1)$ [Using point – slope form]
Substituting the value of m, we obtain
$y - y1 = \frac{y2 - y1}{x2 - x1} (x - x1)$

This is the required equation of the line in two point form.

Now try it yourself! Should you still need any help,click here to schedule live online session with e Tutor!

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Reference Links :

- http://en.wikipedia.org/wiki/Linear_equation#General_form
- http://en.wikipedia.org/wiki/Slope
- http://en.wikipedia.org/wiki/Intercept
- http://en.wikipedia.org/wiki/Perpendicular

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